

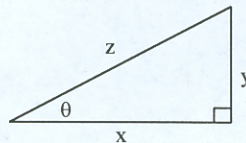
## ALGEBRA AND TRIGONOMETRY SELF-DIAGNOSTIC EXAM

**Do not** use a calculator, book, or notes for any part of the exam. The suggested time to complete the exam is 90 minutes; however, make sure to attempt every problem.

1. Simplify:  $\frac{(x^2yz^{-2})^3}{(xy^2z)^2}$
2. An equivalent algebraic expression to  $m^{(4x-7y)}$  is:
3. Factor:  $2y^4 - 32x^4$ .
4. Simplify:  $\frac{x}{x^2 + 5x + 6} - \frac{2}{x^2 + 3x + 2}$
5. After rationalizing the denominator of  $\frac{3}{1 - \sqrt{2}}$ , an equivalent expression is:
6. Simplify:  $\frac{\sqrt[5]{64x^5y^{-1}}}{\sqrt[5]{2y^4}}$
7. Simplify:  $32^{4/5}$
8. Solve for  $x$ :  $(x + a)(x - b) = x^2 - 1$
9. After clearing the numerator and denominator of fractions,  $\frac{2x + \frac{1}{4}}{3x - \frac{1}{5}}$  is equivalent to:
10. Given:  $1 - 5x = \sqrt{6x - 7}$ , find all real values of  $x$  which satisfy the equation.
11. The radius of a circular fountain is 10 ft. A sidewalk of uniform width is constructed around the outside of the fountain and has an area of  $69\pi$  ft<sup>2</sup>. How wide is the sidewalk?
12. A train leaves a station and travels north at a speed of 75 mph. Two hours later, a second train leaves on a parallel track traveling north at 125 mph. How far from the station will the faster train overtake the slower train?
13. Use "completing the square" to rewrite  $x^2 - 4x + 3 = 0$  in the form  $(x - c)^2 = d$ .
14. Write an equation for  $y$  in terms of  $x$  assuming that  $y$  is proportional to  $x$  and  $y = 42$  when  $x = 6$ .
15. Given the system of equations  $\begin{cases} 4x + 2y = 14 \\ 2x - 8y = 8 \end{cases}$ , find the value of  $y$ :
16. Given:  $f(x) = 3 + x^2$ , find  $f(x + h) - f(x)$ .
17. Given:  $f(x) = \sqrt{x^2 - 9}$ , find  $f(x - 3)$ .
18. What is the domain of the function  $y = \frac{5}{\sqrt{9 - x}}$ ?

19. Find the slope-intercept form of the line through (1,4) and (3,-2).
20. Temperature  $T$  in degrees Fahrenheit is given by  $T = \frac{9}{5}C + 32$  where  $C$  is temperature in degrees Celsius. What is the Celsius equivalent to  $77^\circ\text{F}$ ?
21. Given  $g(2) = 4$  and  $f(x) = x/2$ , find  $f(g(2))$ .
22. Find the point(s) of intersection of the curves  $x^2 + y^2 = 1$  and  $y + x = 0$ .
23. Given  $f(x) = -3x^2 - 18x - 15$ , find the vertex and the maximum or minimum value.
24. Solve for  $x$ :  $2 \leq 5 - 2x \leq 22$
25. Solve for  $x$ :  $|3x - 2| - 6 \geq 0$
26. Solve for  $x$ :  $x^2 - 35 \leq 1$
27. Find the roots of  $f(x) = (x^2 - 7x + 12)^2$  and state the multiplicity of each.
28. Solve for  $x$ :  $e^{-4x} = e$ .
29. Solve for  $x$ :  $3^{4x+1} - 5 = 22$ .
30. Is the point  $(\frac{-\sqrt{35}}{6}, \frac{-1}{6})$  inside, outside, or on the unit circle?
31. Find  $z$ , given that:  

$$\sin(z) = -\cos(z) \text{ and } \frac{3\pi}{2} \leq z \leq 2\pi$$
32. Given  $f(x) = \sin(4x)$ , find  $f(\frac{\pi}{4})$ .
33. Given:  $2\sin(x) = 1$ , and  $90^\circ \leq x \leq 180^\circ$ . Find  $x$ .
34. Complete the trigonometric identity:  $\sin(\pi - \theta) =$
35. Given  $\sin(x) = -3/5$  and  $x$  is in Quadrant III, find  $\tan(x)$ .
36. If a circle has radius 10 ft, what central angle  $\theta$  corresponds to an arc of length  $110\pi/6$  ft?
37. In the figure,  $\cot(\theta)$  is defined by what ratio?



38. What is the period of  $y = \sin(-2x)$ ?
39. Simplify the expression  $\left(\frac{\cot \theta \sec \theta}{\csc^2 \theta}\right)$ :
40. Simplify the expression  $(\sec t - \tan t)(\sec t + \tan t)$ :